

Martimo K, Shiri R, et al. Effectiveness of an ergonomic intervention on the productivity of workers with upper-extremity disorders—a randomized controlled trial. Scand J Work Environ Health 2010;36(1):25-33.

Design. Randomized controlled trial

Population/sample size/setting:

- 168 workers (146 women, 22 men, mean age 45) covered by three occupational health service units in Helsinki
- The occupational health units covered 25,000 employees; all employees seeking medical advice for upper extremity symptoms of less than 30 days duration were potentially eligible
- All potentially eligible subjects were invited to be examined by a trained occupational health physician
- At the examination, all employees with medically verified medial/lateral epicondylitis, rotator cuff tendonitis/impingement syndrome, wrist tendonitis, and nerve entrapment of median or ulnar nerve, were invited to participate in a study of ergonomic intervention in the workplace; workers with no specific diagnosis were included with the diagnosis of “nonspecific, upper-extremity pain”
- Exclusion criteria were: immediate sick leave needed, earlier of planned surgery for an upper extremity disorder, malignancy, upper limb deformity, fibromyalgia, pregnancy, or impending retirement

Main outcome measures:

- Baseline data collected for work exposures and symptom interference with work productivity
- Work exposures included frequency of lifting > 5 kg, working with hands above shoulder level, keying, forceful gripping, pinch grip with wrist deviation, and frequent elevations of the arms
- Work exposures were classed as present if the worker was exposed for >10% of the workday
- Work strain measured on a self-rated scale of 5 items for job demands and 9 items for job control; scores above the median were categorized as high job strain”
- Baseline data were also collected on smoking, waist circumference, fear-avoidance beliefs, and on the degree of pain interference with work, leisure time activity, and sleep
- Primary outcome of the study was self-assessed productivity loss at work, measured at baseline and again at 8 weeks and 12 weeks
- Productivity loss was measured by asking the subject about the most recent working day, with work quantity (0=practically nothing performed, 10=regular quantity performed) and quality (0=very poor quality, 10=regular quality); a score of 0-9 on either scale was classified as “reporting productivity loss”

- Subjects randomized into intervention group (n=84) and control group of usual medical care (n=84), using block randomization to assign equal numbers of subjects with symptoms of wrist/forearm, elbow, and shoulder)
- In the intervention group, the occupational physician contacted each employee's supervisor at work; this was followed a few days later by the visit of an occupational therapist to the workplace to find ergonomic improvements at the job site (physical work environment, tools, force requirements, work pace and breaks during work, etc)
- Among the 168 randomized subjects, there were 47 with specific shoulder disorders, 49 with epicondylitis, 17 with wrist tendonitis, 8 with CTS or ulnar nerve, and 4 "other"
- At baseline, the proportion of each group reporting productivity loss was similar, 53.8% in the intervention group and 57.9% in the control group
- 412 ergonomic interventions were implemented or planned; the majority (60%) involved changes in posture, use of tools, and work organization; 25% involved changes to be implemented later, such as purchasing new tools and reorganizing the work environment
- At 8 weeks, there was a non-significant advantage in favor of the intervention group for productivity loss: 32.9% vs. 44.1% for the control group
- At 12 weeks, there was a significant advantage for the intervention group: 25% with productivity loss vs. 51.8 in the control group when all subjects were analyzed together
- These follow-up analyses were adjusted for age, gender, physical work load factors, fear-avoidance beliefs, and follow-up time
- The ergonomic intervention effect appeared greatest in subjects with milder levels of productivity loss at baseline; differences between the intervention and control groups were not observed in the group that had more than 20% productivity loss at baseline
- In addition to baseline productivity loss, other factors were also associated with whether or not the ergonomic intervention made a difference: keying (no if the job required keying; yes if the job required physical work loads other than keying), sickness absence before the study began (no if there was work absence, yes if there had been no work absence), fear-avoidance beliefs (no if there were high levels of fear-avoidance, yes if there were low levels of fear-avoidance)
- Intervention and control groups did not differ at 12 weeks on pain intensity or on pain interference with work

Authors' conclusions:

- Early ergonomic intervention in addition to medical care may reduce productivity loss associated with upper extremity disorders more effectively than medical care alone
- Pain relief does not explain the productivity gain, since pain intensity did not appear to be reduced by the ergonomic interventions

- Because the intervention effect was greater in workers with higher physical load factors at work, the effect may be due to reduction in physical load factors
- When the severity of the upper extremity disorder is more severe, the effect of the intervention may be less
- Limitations of the study include its small size, lack of an objective measurement of productivity, and lack of information about how many potential subjects declined participation in the study
- Many of the suggested interventions were not implemented immediately, and their effects may not have been observed during the time frame of the study

Comments:

- The sample size was less than that which had been planned by the authors; this was due to difficulty in recruitment of subjects, and tends to reduce the power of the study to detect true differences in productivity loss
- Although the groups differed on loss of productivity, they did not differ on scores measuring pain interference with work
- This suggests that productivity loss and pain interference with work are measuring different constructs; a reliability measure (such as Cronbach's alpha) would have elucidated this, but was not done
- The subjects were asked about productivity loss on the most recent full work day; this is a very short time interval to measure the main outcome, and would be subject to day-to-day variation which would be avoided if the previous week were the focus of inquiry
- If the effect of the limited time data is to increase the variability of the productivity data, that would be expected to lead to a diminished power to detect actual differences in the main outcome
- The nature of the control treatment is not clear; the reference describing the control treatment is a Finnish web site with no English translation
- On balance, the limitations of the study are of a nature that would tend to weaken its ability to detect actual outcome differences between the ergonomic and usual care groups

Assessment: Adequate for an evidence statement that there is some evidence that early workplace ergonomic intervention may prevent loss of work productivity, especially if the job entails the handling of high physical loads